ADVANCES IN COMPOSITE MATERIALS

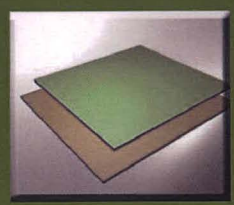

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Table of Content

Chapter 015

Fabrication of Metal Matrix Composite Automotive Brake Rotor: Part 1

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Keywords: Metal matrix composite, brake rotor, fabrication methods, stir casting, microstructure.

Abstract: Fabrication process selection plays a big role in the development process. The fabrication processes those are suitable for automotive brake rotor production have been identified and presented in this paper. A detail fabrication method steps for the fabrication of SiC reinforced aluminium matrix composite (Al-MMC) brake rotor using stir casting process has been explained. Several factors such as stirrer blade (impeller blade) length and angle, stirring the semi-liquid metal, stirring time are considered during fabrication process. It is found that the fabrication method (which is stir casting) among other fabrication methods, is better choice than others due to its simplicity, lower processing temperature, leading to longer die life and high production cycle time, flexibility and applicability to large quantity production. The microstructure of Al-MMC from the stir casting showed homogeneous cast composition whereby almost uniform distribution of SiC particles in the matrix.

Introduction

Metal matrix composites are fabricated in solid, liquid or gaseous state processes. Selection of matrix materials for a composite structure requires a great consideration. Factors involve in composite manufacturing are: suitable matrix materials, reinforcement types (the form in which the reinforcement is to be used), and heat treatment. Ceramic particulate is the 'reinforcement of choice', since it provides higher wear resistance, strength and stiffness. These composite materials offer outstanding properties such as high strength-to-weight ratio, stronger and stiffer, hhighly wear and corrosion resistant, outstanding durability and low cost processing route. The AMCs are increasingly being used in high-tech structural and functional applications including automotive, aerospace, defense and thermal management areas, as well as in sports and recreation [1].

The understanding of the capabilities and limitations of manufacturing processes are important to create cost-effective designs, regardless of the materials to be used. In order to design composite structure, it is essential that the processes be understood. Selection of processes depends on:

- the type and form of material
- the shape of the parts to be made
- the quantity to be produced
- the quality, e.g., tolerances required